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Simulating Assignment Incentive Pay for Enlisted U.S. Sailors

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Sponsor: **N-1/NPRST**

Research Question

Primary

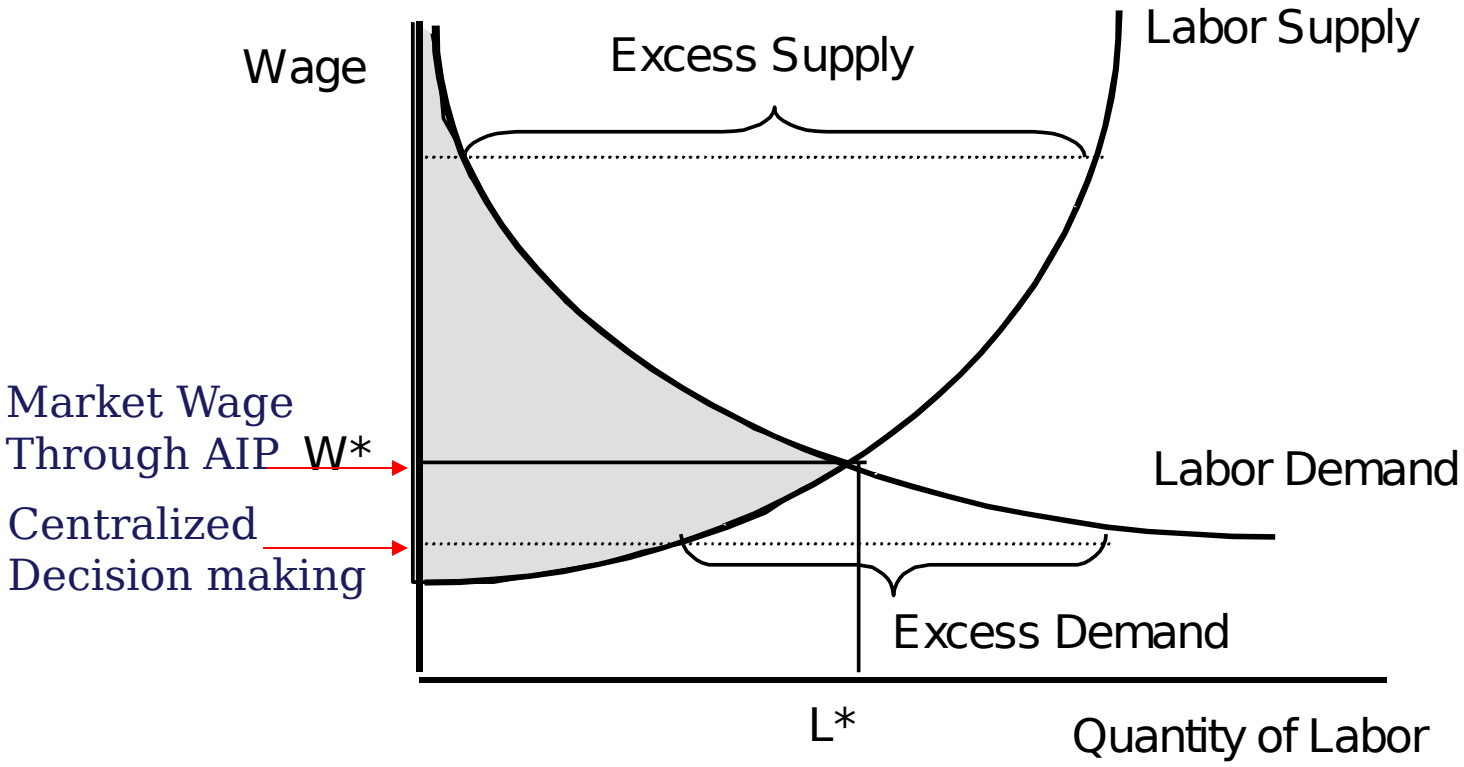
- Does Assignment Incentive Pay increase simulated performance for the Navy's enlisted personnel assignment process?

- What is the most effective implementation strategy?

Secondary

- Can AIP be incorporated in the Navy Enlisted Distribution Simulator (NEDSim)?

Background


Wage
Excess Supply
Labor Supply
Market Wage
Through AIP W*
Centralized
Decision making
Labor Demand
Excess Demand
L*
Quantity of Labor

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Methodology

Sailor Rate
Sailor NEC
Sailor Experience
Sailor Performance

Generate Sailor Profiles

Generate Billet Profiles

Billet Rate
Billet Location
Billet NEC
Billet Skill

Spouse can find job?
Cost of Living at Location
Billet Visibility
Shore or Sea Billet

Generate Sailor Preferences for Billets

Generate Billet Preferences for Sailors

Correct NEC
Correct Paygrade
Relevant Experience
Performance

Match Sailors to Jobs
(Deferred Acceptance & Linear Programming)

Compare Assignments
(Quality, Quantity & Composite Measures)

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Methodology

Family Life Factor	Location Factor	Billet Visibility	Billet Sea or Shore	AIP	Score
Excellent	Excellent	Excellent (Billet rate ≥ 2 rates above Sailor rate)	Shore	Excellent	5
High	High	High (Billet rate = 1 rate above Sailor rate)		High	4
Average	Average	Average (Billet rate = Sailor rate)		Average	3
Moderate	Moderate	Low (Billet rate = 1 rate below Sailor rate)		Moderate	2
Low	Low	Extremely Low (Billet rate ≤ 2 rates below Sailor rate)	Sea	Low	1

Methodology

**How to establish the inverse relationship b
the utility sailors gain from AIP and the u
Navy gains from AIP ?**

Sailor utility from the AIP of a billet:
SAIP: randomized ranging from 1 (low AIP) to 5 (high

Navy utility from the AIP of a billet:
Needs to be inversely related to the sailor's utility:

BAIP = 6 - SAIP

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Methodology

Command Utility = β_1(NEC) + β_2(Paygrade) + β_3(Ex
+ β_4(Performance) + β_5(BAIP)

Scenario	β_{NEC}	β_{pay}	β_{exp}	β_{perf}	β_{AIP}
Equal	0.2	0.2	0.2	0.2	0.2
Money	0.1	0.1	0.1	0.1	0.6
Quality	0.22	0.22	0.22	0.22	0.12

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Methodology

Typical two week requisition cycle:

- 60 billets available for 45 sailors
- About 15% of the billets are priority 1
- Preference list of 5, later 10
- Simulated 100 requisition cycles

Methodology

- **Quantity measure**
  - **Percentage matched**
- **Quality measures**
  - **Command utility**
  - **Percentage unstable matches**

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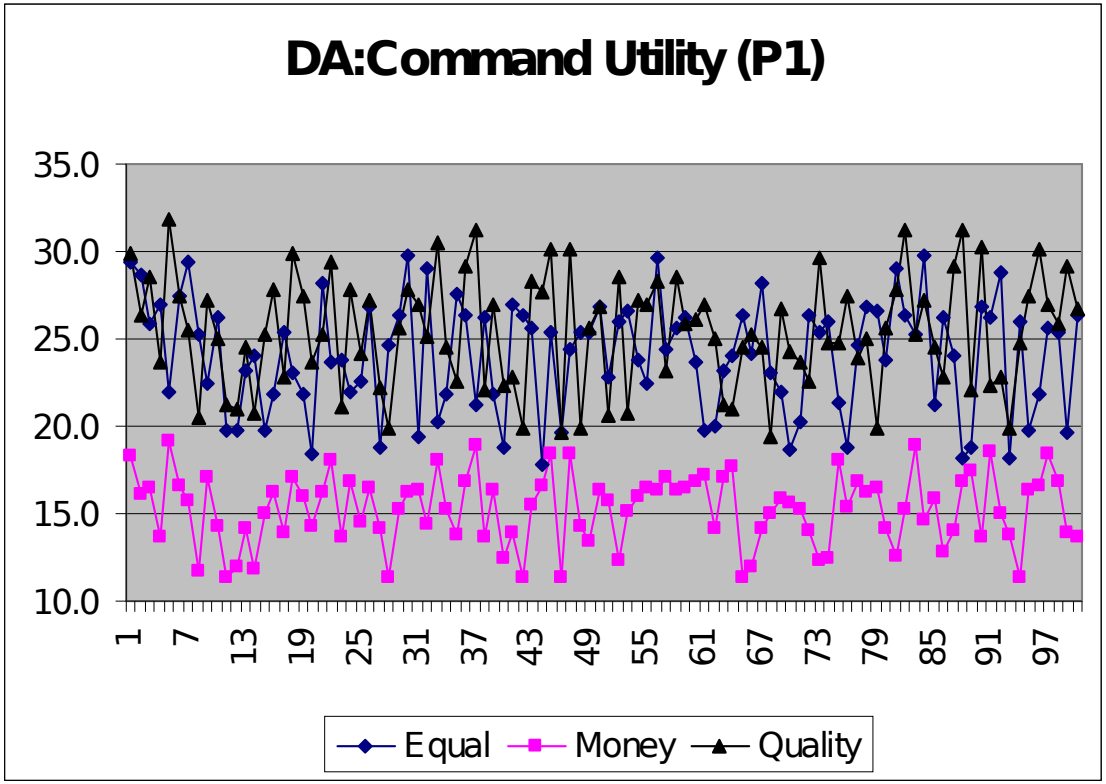
Findings

ommand utility is lower if the Navy tries to save mor

Utility is 66.6% higher for “Quality” than Money”



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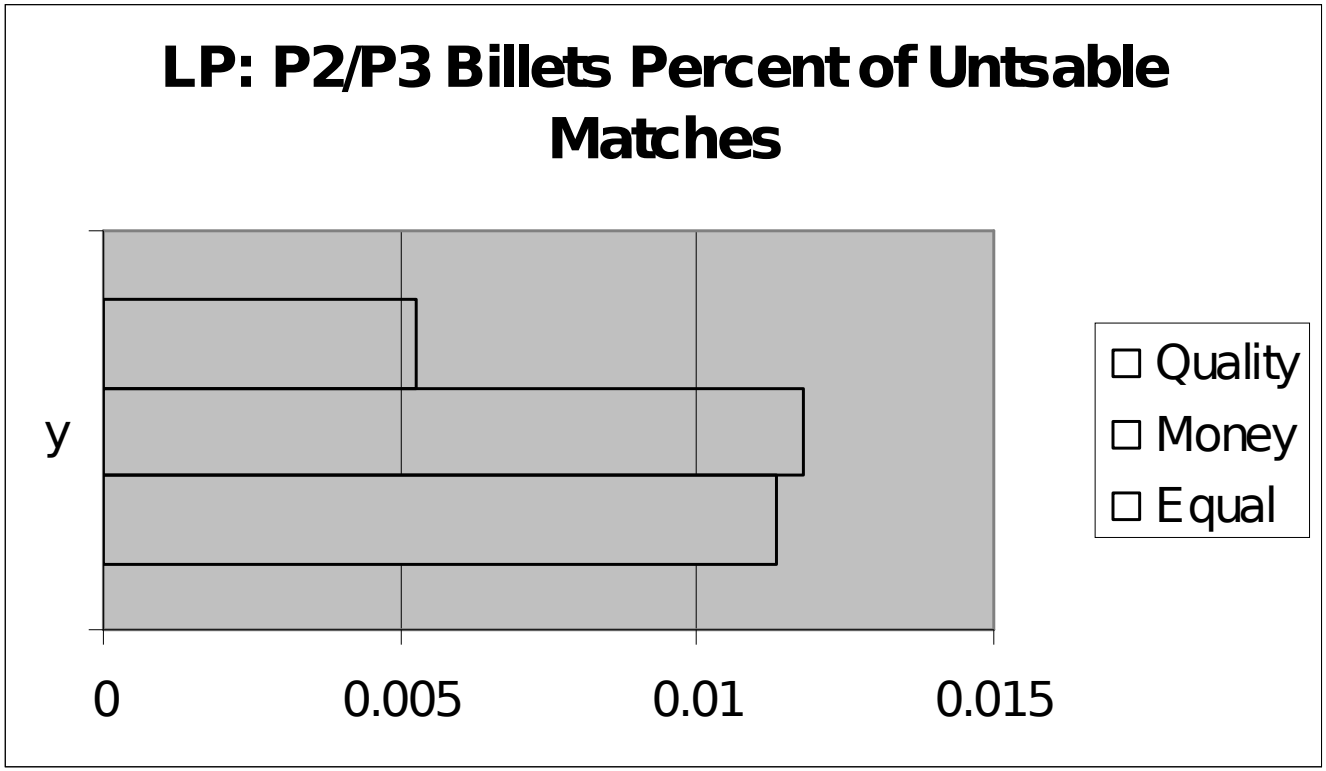
Findings

The “Quality” scenario reduces unstable matches for P2/P3 billets by 50% compared to other scenarios (significant at 10%-level)



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Findings

Doubling the preference list length:

- cuts unstable matches significantly for P1 billets in the “Quality” scenario
- cuts unstable matches by ~50% for P2/P3 billets in the “Quality” scenario (significant at the 10%-level)
- increases the average percentage of matches

  P2/3 matches almost tripled in “Quality” scenario

Findings

But:

- weights might also affect bidding behavi (encourage/discourage)
- simulation needs to be verified with real data by econometricians

Conclusion and Recommendations

- Emphasize sailor quality over saving AIP money
  to increase overall utility (including pecuniary benefits)
- Emphasize quality to increase the number of stable matches if using an LP assignment mechanism
- Double the preference list lengths to increase the percentage matched and decrease

Conclusion and Recommendations

Sometimes, it pays to spend money!

Further Research

- Simulate AIP business rules that model observed bidding behavior
  - Experimental analysis
  - Actual AIP results
- Analyze alternative optimization algorithms
- Develop detailer decision support system

Questions ?

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